Space Weather Technical Forecast

Issued on Tuesday, 02 August 2022 at 01:21 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of Active (Kp4) geomagnetic activity. Chance of Active electron fluence from day 3.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours, with one long duration C9.2 flare from the eastern limb ending around 01/0230 UTC. There are currently two sunspot regions on the visible disc. AR3068 in the SE has shown minor growth with several intermediate spots. AR3070 in the NE is a weak, simple and stable spot. No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: Solar winds, as measured by DSCOVR at L1, indicate that earth is within a Coronal Hole High Speed Stream, likely from CH07/-. Wind speeds have fluctuated between 430 and 550 km/s. Density was around average. The total interplanetary magnetic field (IMF), Bt was generally weak, below 8 nT. The north-south component, Bz, fluctuated weakly between +5/-6 nT. The Phi angle was mostly negative (towards the Sun). Geomagnetic activity was mostly Quiet (Kp 1-2), with one Unsettled interval (Kp 3).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV), as measured by GOES-16 was at background levels. The high energy electron flux (greater than 2 MeV) varied between background and moderate levels. Electron fluence showed an erratic but trend, but remained well below the Active threshold (1e8 integrated flux), with an observed fluence value of 3.53e6 integrated pfu recorded at 02/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low solar activity is expected to continue, with a slight chance of M-class flares. Flare risks possibly increasing due to active regions rotating onto the visible disk in coming days.

Solar Wind / Geomagnetic Activity: No Earth directed CMEs are currently expected. Solar winds are slightly-elevated due to the onset of the HSS from CH07/-. Solar winds are expected to remain elevated or slightly elevated until day 3 (04 Aug), when wind speeds are expected to fall back to background levels for the remainder of the period.

Geomagnetic activity should remain mainly Quiet with a chance of Unsettled or Active intervals through the period.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to remain at background levels. The high energy electron flux (greater than 2 MeV) is expected to remain mostly at background to moderate levels, but with a chance of rising to give high levels at the diurnal maxima, with a chance of becoming prolonged high from day 3 (04-05 Aug). The corresponding 24 hour fluence is most likely to remain below the Active threshold (1e8 integrated pfu) but on a steadily increasing trend.

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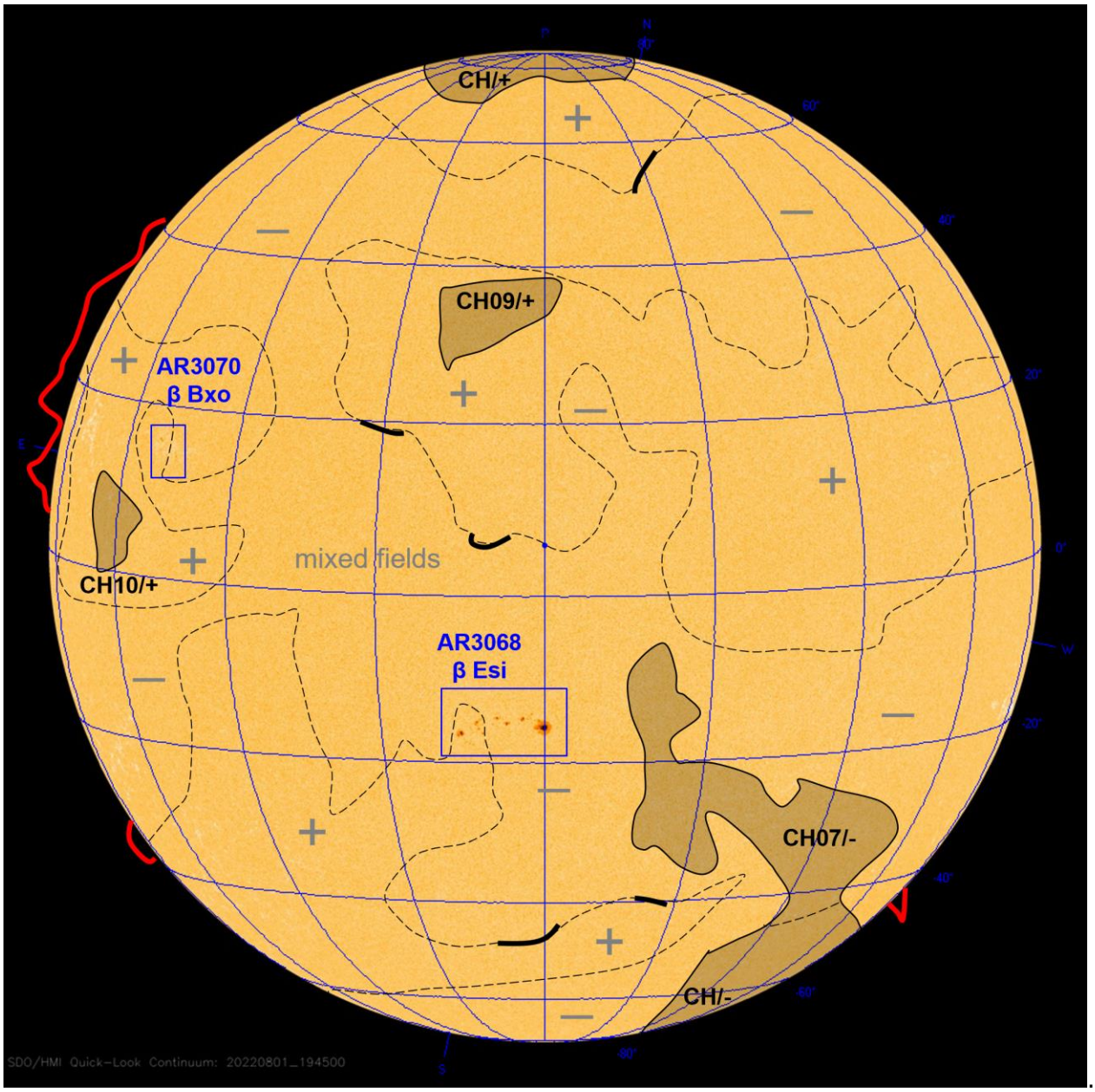
Figure 1. Solar Analysis Valid 01/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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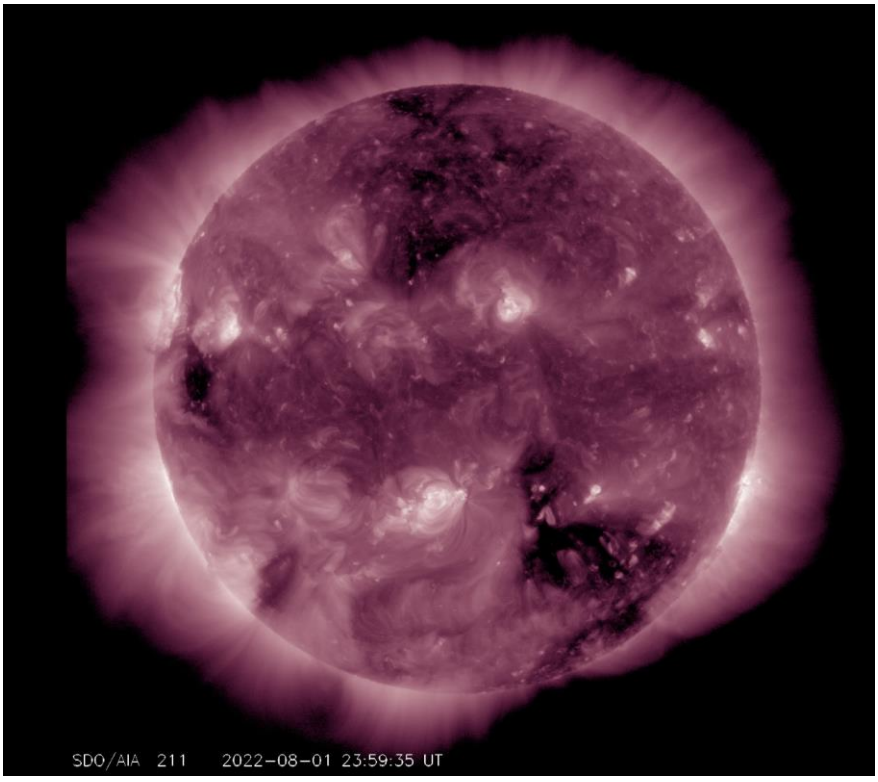
Geomagnetic Storms:

No Earth directed CMEs are currently expected. Earth experiencing elevated solar winds, most likely due ongoing influence from the HSS of CH07/-. This is a large northward extension of the southern polar crown, spanning nearly 50 degrees of longitude along the southern hemisphere. Solar winds are expected to remain elevated or slightly elevated whilst in the HSS of CH07/-, which last up until midday on 4th Aug, after which wind speeds are expected to fall back to background levels. There is a marginally higher risk of G1/minor storms on 4th Aug due to the transition period out of CH07/- and possibly into a CIR.

Geomagnetic activity should remain mainly Quiet with a chance of Unsettled or Active intervals through the period.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	10	15	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: AIA 211 magery showing the large CH07/- in the southwest.



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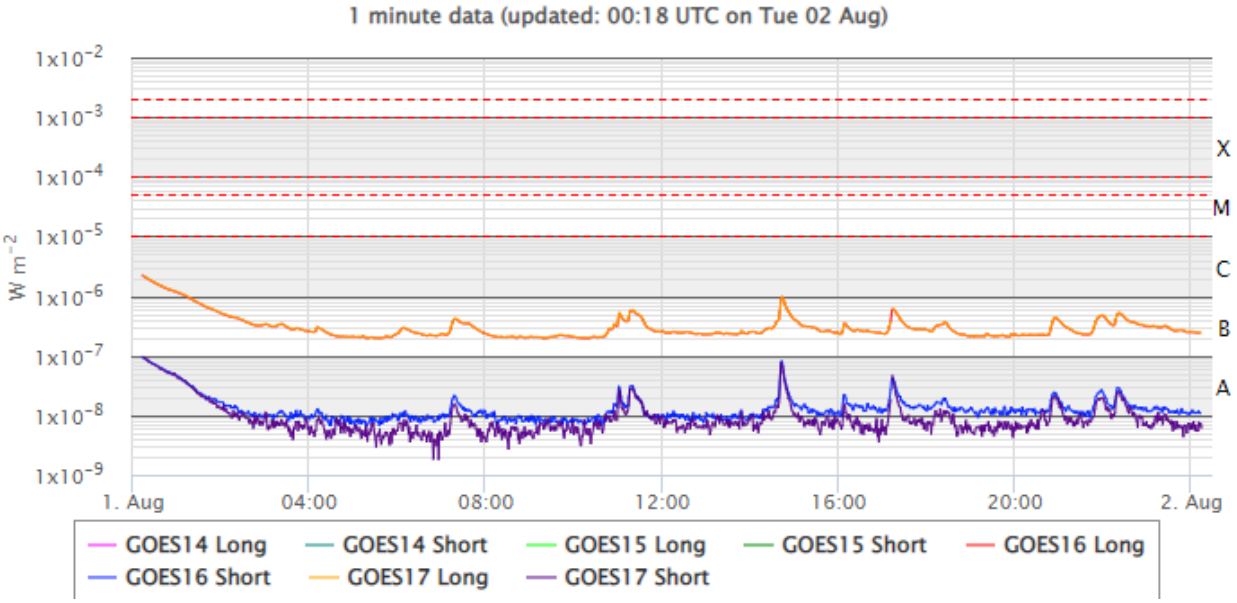
Radio Blackouts - X-Ray Flares:

Solar activity is currently low, with a long duration C9.2 flare ending 01/0230 UTC. This originated from just around the northeast limb, lasting several hours, indicating a likely active region just beyond the limb. There is one sunspot region on the visible disk, AR3068 (Esi/Beta) near the central meridian. STEREO imagery suggests the potential for further active regions to rotate onto the Earth-facing disc through the period. Activity is expected to remain Low, with a slight chance of rising to Moderate from any M-class flares.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	15	20	20	20
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: 24hr Xray trace observed by GOES16



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at Background levels and is expected to remain at this level through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

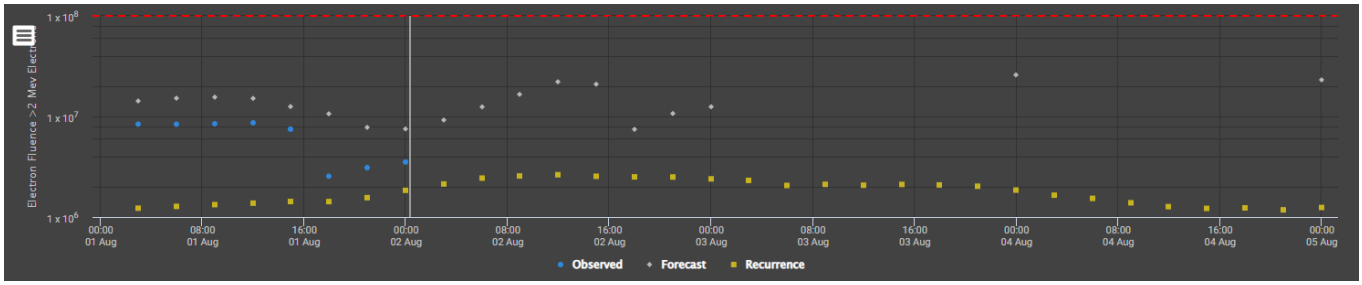
High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2 MeV) is initially expected to remain mostly at background to moderate levels, with an increasing chance of breaching the 1000 pfu high threshold during the diurnal maximum. This is due to the charging effects of the HSS from CH07/- until day 3, then the reduction in solar winds speeds allowing the Van Allen belts to relax late day 3 into day 4.

The 24 hour fluence is most likely to remain below the Active threshold (1e8 integrated pfu) with an increasing trend through the period.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	10	20	30	40
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 4: REFM showing observed, forecast and recurrance of integrated flux/fluence.



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